REMARKS

Claims 1-29 are all the claims presently pending in the application. Claims 1-2 and 19-20 have been amended to further define the claimed invention. Claims 21-29 have been added to claim additional features of the invention.

It is noted that the claim amendments are made only for more particularly pointing out the invention, and not for distinguishing the invention over the prior art, narrowing the claims or for any statutory requirements of patentability. Further, Applicant specifically states that no amendment to any claim herein should be construed as a disclaimer of any interest in or right to an equivalent of any element or feature of the amended claim.

Claims 1-20 stand rejected upon informalities (e.g., 35 U.S.C. § 112, second paragraph). Claims 1-20 stand rejected under 35 U.S.C. § 102(e) as being anticipated by Taniuchi, et al. (U.S. Patent No. 6,013,393). Claims 1 and 3-20 stand rejected under 35 U.S.C. § 102(e) as being anticipated by Hasegawa, et al. (U.S. Patent No. 5,972,539).

These rejections are respectfully traversed in view of the following discussion.

I. THE CLAIMED INVENTION

The claimed invention (e.g., as defined by claim 1) is directed to a lithium battery which includes a power-generating element having a positive electrode, a negative electrode and a separator, each of which includes a gel electrolyte which includes a polymer and a liquid electrolyte. The gel electrolyte includes a liquid electrolyte having a concentration of lithium salt in a range from 2 to 4 mols per liter of the liquid electrolyte, and a polymer including a polymerized polyfunctional (meth) acrylate monomer, the gel electrolyte including the polymerized polyfunctional (meth) acrylate monomer in a range from 5% to 30% by weight.

Importantly, the gel electrolyte in the separator is different than the gel electrolyte in the positive and negative electrodes.

As explained in the Application, in conventional batteries the diffusion of lithium ion cannot overtake the demand rate of lithium ion required by the positive electrode during high rate discharge, making it difficult to keep the battery performance at a sufficient level (Application at page 3, line 21-page 4, line 1).

The claimed invention, on the other hand, includes a power-generating element having positive and negative electrodes and a separator, each of which includes a gel electrolyte, and the gel electrolyte in the separator is different than the gel electrolyte in the positive and negative electrodes (Application at page 11, line 12-page 13, line 20). This feature may help to allow the inventive battery to provide a good high rate discharge performance (e.g., see Table 1 on page 18).

II. THE 35 USC §112, SECOND PARAGRAPH REJECTION

Claims 1-20 stand rejected under 35 U.S.C. §112, second paragraph.

However, Applicant notes that claims 1 and 19-20 have been amended to address the Examiner's concerns. Specifically, these claims have been amended to recite *"wherein said gel electrolyte comprises said polymerized polyfunctional (meth) acrylate monomer in a range from 5% to 30% by weight, based on a total weight of said polymer and said liquid electrolyte"*.

In view of the foregoing, Applicant submits that these claims are not indefinite as alleged by the Examiner. Therefore, the Examiner is respectfully requested to withdraw this rejection.

III. THE PRIOR ART REFERENCES

A. The Taniuchi Reference

The Examiner alleges that Taniuchi teaches the claimed invention of claims 1-20. Applicant submits, however, that there are elements of the claimed invention which are neither taught nor suggested by Taniuchi.

Taniuchi discloses an ionic conductive polymer gel for a secondary battery. The battery has an electrolyte salt component which includes a sulfonated derivative with formula $LiX(SO_2R^1)_n$, where X is N, C, B, O or $-C(R^2)_m-$ in which R^2 is a hydrogen atom, an alkyl group having 1

to 12 carbon atoms, and m is an integer of 1 to 2, R^1 is a halogenated alkyl group having 1 to 12 carbon atoms, and n is an integer of 1 to 3, a non-aqueous solvent, and a polymer matrix prepared by polymerizing a polymerizable material including at least one (meth) acrylate monomer with a molecular weight of 1000 or less, in the presence of the electrolyte salt component and the non-aqueous solvent. A lithium-ion battery utilizes the ionic conductive polymer gel (Taniuchi at Abstract).

Applicant submits, however, that Taniuchi does not teach or suggest *"wherein said gel electrolyte in said separator is different than said gel electrolyte in said positive and negative electrodes"*, as recited, for example, in claims 1 and 19-20.

As noted above, unlike conventional batteries in which the diffusion of lithium ion cannot overtake the demand rate of lithium ion required by the positive electrode during high rate discharge, making it difficult to keep the battery performance at a sufficient level, the claimed invention includes a power-generating element having positive and negative electrodes and a separator, each of which includes a gel electrolyte, and the gel electrolyte in the separator is different than the gel electrolyte in the positive and negative electrodes (Application at page 11, line 12-page 13, line 20). This feature may help to allow the inventive battery to provide a good high rate discharge performance (e.g., see Table 1 on page 18).

For example, in one exemplary embodiment (e.g., Example 1) described in the Application, a positive composite 1 and negative composite 2 were formed by dipping a positive active material sheet and a negative active material sheet in an electrolyte solution (e.g., a liquid electrolyte mixed with an acrylate monomer (chemical formula 1) in an amount of 15% based on a total weight of liquid electrolyte and monomer) (Application at Figure 1; page 12, line 12-page 13, line 5). To form the chemical separator 5, on the other hand, a liquid electrolyte was mixed with a bifunctional acrylate monomer (chemical formula 2) in an amount of 10% based on a total weight of liquid electrolyte and monomer). The resulting battery provided at least a satisfactory discharge capacity (e.g., see Table 1 on page 18).

Clearly, Taniuchi does not teach or suggest this feature of the claimed invention. Indeed, Taniuchi may teach that the positive and negative electrodes are integrated with the separator

teaches the claimed invention. However, Taniuchi merely teaches that the positive and negative electrodes are integrated with the separator (Taniuchi at col. 8, lines 4-21). That is, Taniuchi teaches that a polymer gel (e.g., the same polymer gel) may be integrated with each battery element (Taniuchi at col. 8, lines 11-12).

That is, nowhere in these passages, or anywhere else for that matter, does Taniuchi teach battery elements having different polymer gels. Thus, in contrast to the claimed invention, nowhere does Taniuchi teach or suggest a gel electrolyte in the separator which is different than the gel electrolyte in the positive and negative electrodes.

Therefore, Applicant respectfully submits that there are elements of the claimed invention that are not taught or suggested by Taniuchi. Therefore, the Examiner is respectfully requested to withdraw this rejection.

B. The Hasegawa Reference

The Examiner alleges that Hasegawa teaches the claimed invention of claims 1-20. Applicant submits, however, that there are elements of the claimed invention which are neither taught nor suggested by Hasegawa.

Hasegawa discloses a flame retardant solid electrolyte which includes an ion conductive polymer matrix having moieties capable of imparting flame retardance to the polymer matrix and ether bonds in the molecule and an electrolyte salt dispersed in the polymer matrix. The flame retardant solid electrolyte includes a non-ion-conductive polymer matrix and a liquid electrolyte consisting of an electrolyte salt dissolved in a solvent, which is dispersed in the polymer matrix. Further, the flame retardance-imparting moieties are derived from halogen or phosphorus-bearing compounds (Hasegawa at Abstract).

Applicant submits, however, that Hasegawa, like Taniuchi does not teach or suggest *"wherein said gel electrolyte in said separator is different than said gel electrolyte in said positive and negative electrodes"*, as recited, for example, in claims 1 and 19-20.

As noted above, unlike conventional batteries in which the diffusion of lithium ion cannot overtake the demand rate of lithium ion required by the positive electrode during high rate

discharge, making it difficult to keep the battery performance at a sufficient level, the claimed invention includes a power-generating element having positive and negative electrodes and a separator, each of which includes a gel electrolyte, and the gel electrolyte in the separator is different than the gel electrolyte in the positive and negative electrodes (Application at page 11, line 12-page 13, line 20). This feature may help to allow the inventive battery to provide a good high rate discharge performance (e.g., see Table 1 on page 18).

Clearly, Hasegawa does not teach or suggest this feature of the claimed invention. Indeed, the Examiner relies on columns 9, 10 and 13 of Hasegawa to support her allegations that Hasegawa teaches the claimed invention. However, Hasegawa merely teaches that positive and negative electrodes may be integrally combined with a solid electrolyte (Hasegawa at col. 12, lines 50-65).

That is, nowhere in these passages, or anywhere else for that matter, does Hasegawa teach positive and negative electrodes including an electrolyte which is different from an electrolyte in a separator. Thus, nowhere does Hasegawa teach or suggest a gel electrolyte in the separator which is different than the gel electrolyte in the positive and negative electrodes.

Therefore, Applicant respectfully submits that there are elements of the claimed invention that are not taught or suggest by Hasegawa. Therefore, the Examiner is respectfully requested to withdraw this rejection.

IV. FORMAL MATTERS AND CONCLUSION

In view of the foregoing, Applicant submits that claims 1-29, all the claims presently pending in the application, are patentably distinct over the prior art of record and are in condition for allowance. The Examiner is respectfully requested to pass the above application to issue at the earliest possible time.

Should the Examiner find the application to be other than in condition for allowance, the Examiner is requested to contact the undersigned at the local telephone number listed below to discuss any other changes deemed necessary in a telephonic or personal interview.

The Commissioner is hereby authorized to charge any deficiency in fees or to credit any overpayment in fees to Attorney's Deposit Account No. 50-0481.

Respectfully Submitted,

Date: 7/21/04

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